

WHAT IS CLAIMED IS:

1. A process for forming a three-dimensional fibrous panel, comprising the steps of:

5 providing first and second mold members each comprising a porous support plate and a plurality of rigid mold pieces attached to the support plate, the mold pieces comprising truncated 3D tapered structures and being spaced apart on the support plate to form channels between the mold pieces, the mold pieces of the second mold member having a larger cross-section and lesser taper than the mold pieces of the first mold member;

10 depositing a fiber stock into the first mold member to cover the mold pieces, and pressing the fiber stock into the first mold member to dewater the stock through the porous support plate and densify the stock so as to form a panel having ribs as defined by the channels in the first mold member;

15 removing the panel from the first mold member and inserting the panel into the second mold member; and

 pressing the panel into the second mold member to further dewater and densify the panel.

2. An apparatus for molding fibrous panels from a fiber stock, comprising:

20 first and second mold members each comprising a porous support plate and a plurality of rigid mold pieces attached to the support plate, the mold pieces comprising truncated 3D tapered structures and being spaced apart on the support plate to form channels between the mold pieces, the mold pieces of the second mold member having a larger cross-section and lesser taper than the mold pieces of the first mold member; and

25 a flat mold plate for pressing a fiber stock into each of the first and second mold members.

3. The apparatus of claim 2, wherein the support plates comprise screens.

4. The apparatus of claim 2, wherein the mold pieces are metal.

5. The apparatus of claim 2, wherein the first and second mold members are non-metallic.

6. The apparatus of claim 2, wherein the first and second mold members are ceramic.

5 7. The apparatus of claim 2, wherein the first and second mold members are resinous.

8. The apparatus of claim 2, wherein at least one of the first and second mold pieces have water drain passages therethrough.

9. The apparatus of claim 2, wherein the mold pieces of the second mold member
10 define a draft angle from about 2 degrees to about 30 degrees.

10. The apparatus of claim 2, wherein the mold pieces of the first mold member define a draft angle at least about 3 degrees greater than that defined by the mold pieces of the second mold member.

11. The apparatus of claim 2, wherein the mold plate has water drain passages
15 therethrough.

12. The apparatus of claim 2, wherein the mold pieces of the second mold member have a smaller height than the mold pieces of the first mold member.

13. A process for forming a three-dimensional fibrous panel, comprising the steps of:

20 depositing a fiber stock into a first mold member, the first mold member comprising a flat, first support plate having a top surface and a bottom surface and water drain passages extending therebetween, and a plurality of rigid first mold pieces affixed to the top surface of the first support plate, the first mold pieces comprising truncated 3D tapered structures having generally flat upper surfaces and having side surfaces extending
25 from the upper surfaces down to the first support plate, the first mold pieces being spaced apart on the first support plate so as to define channels between the first mold pieces, wherein said side surfaces of the first mold pieces form a first nonzero draft angle relative

to vertical, the fiber stock filling the first mold member to a depth greater than a height of the first mold pieces so that the stock covers the upper surfaces of the first mold pieces;

disposing a flat mold plate atop the stock in the first mold member, and urging the mold plate toward the first mold member to compress the stock into the first mold

5 member and cause water to be drained from the stock through the water drain passages so as to form a panel having a flat face and intersecting ribs projecting therefrom as defined by the channels in the first mold member;

removing the panel from the first mold member;

inserting the panel into a second mold member having a second support plate with
10 water drain passages therethrough and rigid second mold pieces affixed to the second support plate and arranged to form channels that receive the ribs on the panel, the second mold pieces having generally flat upper surfaces and having side surfaces extending from the upper surfaces down to the second support plate, wherein said side surfaces form a second draft angle relative to vertical, the second mold pieces being shorter in height than
15 the first mold pieces, the second draft angle of the second mold pieces being smaller than the first draft angle of the first mold pieces, and the channels of the second mold member being narrower than the channels of the first mold member;

disposing the mold plate atop the panel and urging the mold plate toward the second mold member to compress the panel into the second mold member and cause
20 further water to be drained from the panel through the water drain passages, the panel being compressed and densified in a thickness direction of the panel and the ribs also being densified in a lateral direction by virtue of the channels being narrower than those of the first mold member; and

removing the panel from the second mold member.

25 14. The process of claim 13, further comprising the step of thermally drying the panel while the panel is disposed in the second mold member.

15. The process of claim 14, wherein the second mold member is non-metallic, and the step of thermally drying the panel comprises microwave drying the panel while disposed in the second mold member.

16. The process of claim 13, further comprising the step of thermally drying the panel after removal from the second mold member.

17. A fibrous panel molded from a fibrous stock by a method comprising the steps of:

- 5 providing first and second mold members each comprising a porous support plate and a plurality of rigid mold pieces attached to the support plate, the mold pieces comprising truncated 3D tapered structures and being spaced apart on the support plate to form channels between the mold pieces, the mold pieces of the second mold member having a larger cross-section and lesser taper than the mold pieces of the first mold
- 10 member;
- depositing a fiber stock into the first mold member to cover the mold pieces, and pressing the fiber stock into the first mold member to dewater the stock through the porous support plate and densify the stock so as to form a panel having ribs as defined by the channels in the first mold member;
- 15 removing the panel from the first mold member and inserting the panel into the second mold member; and
- pressing the panel into the second mold member to further dewater and densify the panel;
- the panel thus comprising a face from one side of which project a plurality of
- 20 intersecting ribs molded integrally with the face, the ribs having a configuration precisely defined by the cross-section, taper, and spacing of the mold pieces on the second mold member.

18. The fibrous panel of claim 17, wherein the mold pieces of the second mold member have side faces that are linear in a plane normal to the support plate, such that
- 25 the ribs of the panel have side faces that are linear in a plane normal to the face of the panel.